

# Multiple concomitant anatomical variants challenging synchronous neck and axillary lymphadenectomy and latissimus dorsi flap reconstruction in a patient with malignant melanoma

Jurga Pikturnaite MD MRCS, Thomas C Wright MSc FRCS(Plast), Ian C Josty BSc FRCS(Plast)

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The knowledge of anatomy acquired at the university level carries surgeons through most of their careers. However, it is important to be aware of uncommon anatomical variants when performing surgery. The authors describe a case involving three anatomical variants found in three different anatomical locations in a single patient during one operative episode. These included Langer's muscle, transjugular course of the spinal accessory nerve and unusual layout of the femoral vessels at the inguinal ligament. While cadaveric studies report an incidence of up to 7% for the anomaly of the latissimus dorsi muscle, and up to 1% to 3% for a transjugular accessory nerve, clinical experience suggests that it is considerably rarer and can surprise even experienced surgeons. The wary surgeon, having identified one anomaly in their patient, will be mindful that there may be others.

**Key Words:** Axillopectoral arch; Femoral vessels; Langer's muscle; Spinal accessory nerve; Transjugular

Knowledge of human anatomy acquired at the university level carries surgeons through most of their careers. However, it is important to be aware of uncommon anatomical variants when performing surgery. We describe a case of three anatomical variants found in three different anatomical locations in a single patient during one operative episode. These include Langer's muscle (axillopectoral/axillary arch), transjugular course of the spinal accessory nerve (SAN) and unusual layout of the femoral vessels at the inguinal ligament.

Multiple anomalies in a single anatomical unit, such as the upper limb, are well described and include various combinations of axillopectoral muscle with presence of a third head of biceps brachii, Gantzer's muscle, accessory or abnormal divisions of forearm flexors, unusual muscular innervation (1) and many others. However, multiple variations encountered during a single operative episode in several anatomical parts of the body are uncommon.

## CASE PRESENTATION

A 74-year-old woman presented with a 10 cm locally advanced polypoid nodular ulcerated malignant melanoma with Breslow thickness of 35 mm and Clark's level V. The tumour was located in the posterior

triangle of the neck with a palpable node in the deltopectoral groove, confirmed to be a metastatic melanoma on fine-needle aspiration cytology. The operative plan included synchronous tumour resection with level II-V selective neck dissection (Memorial Sloan-Kettering Cancer Center classification), and complete axillary clearance. Soft tissue reconstruction was planned using a pedicled latissimus dorsi (LD) muscle flap tunnelled through the axilla over the clavicle into the neck. The first anatomical variant was discovered by the anesthetist, who noted an unusual relationship of the femoral vessels just inferior to the inguinal ligament during placement of a femoral venous catheter. The femoral vein was located posterior to the femoral artery, which, in the literature, is reported to be extremely rare (2). The anomaly was visualized using an ultrasound scan that ensured successful and complication-free cannulation but resulted in prolonged procedure time.

During axillary clearance, an accessory slip arising from the main bulk of the LD muscle was found. It passed anterior to the axillary neurovascular structures and to biceps to insert into the proximal humerus having split the anterior portion of the deltoid muscle (Figure 1). In the literature, it is described as axillary or axillopectoral arch and has its name – Langer's muscle – after the Austrian anatomist who first described this anatomical variant in 19th century.

Finally, during neck dissection, the spinal accessory nerve was noted to pierce the internal jugular vein (IJV), which bifurcated to allow the nerve to pass, then reformed into a single trunk superiorly (Figure 2). Compared with the other two variations of the course of the SAN in the anterior neck triangle (crossing the IJV anterior to it in 80% and posterior to it in 19% cases [3]), the transjugular course is extremely rare accounting for 1% to 3% of all studied cases (4,5).

All three findings were later confirmed on retrospective review of the preoperative computed tomography scans.

## DISCUSSION

Separately, all three anatomical variants have been described by other authors; however, none described all three in a single patient.

Traditional teaching in anatomy is that just inferior to the inguinal ligament, the femoral vein runs medial to the femoral artery as it passes deep to the inguinal ligament. The positional relationship between femoral vessels that we found in our patient – in which the femoral vein was located deep to the artery – is rare and only anecdotal cases are reported. Igari et al (2) investigated 2552 limbs with a Doppler ultrasound to identify any anomalies of the femoral vein and its tributaries in relation to the femoral artery. A single case (incidence 0.02%) had

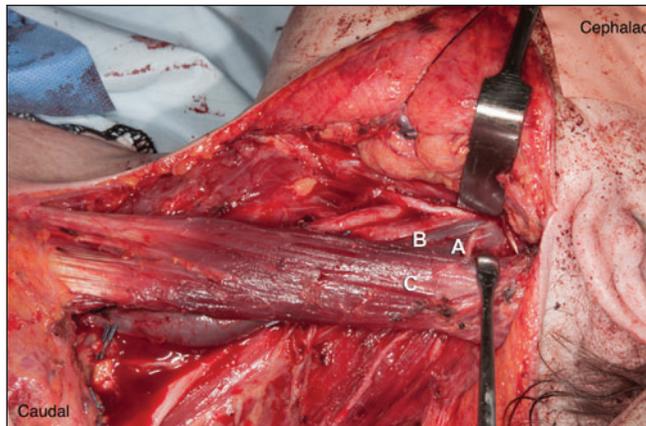
The Welsh Centre for Plastic, Reconstructive Surgery and Burns, Morriston Hospital, Heol Maes Eglwys, Morriston, Swansea, United Kingdom  
Correspondence: Jurga Pikturnaite, The Welsh Centre for Plastic, Reconstructive Surgery and Burns, Morriston Hospital, Heol Maes Eglwys, Morriston, Swansea SA6 6NL, United Kingdom. Telephone 44-1792-702222, e-mail pikturnaite@yahoo.com



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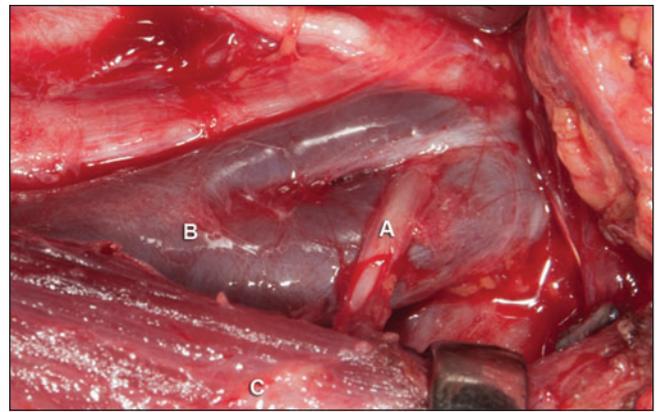
**Figure 1** Perioperative photograph demonstrating Langer's muscle (A); latissimus dorsi muscle (B) axillary vessels (C); thoracodorsal vessels (D); pectoralis major muscle (E); and axillary dissection specimen (F)



**Figure 2** Perioperative photograph demonstrating transjugular course of the spinal accessory nerve (A) on the left side of the neck; internal jugular vein (B); sternocleidomastoid muscle (C)

the femoral vein and artery transposed in the region of the saphenous opening. Given such evidence from the published literature, it is safe to assume that femoral neurovascular anatomy layout is relatively constant inferior to the inguinal ligament and venous cannulation should be safe in this area. However, had we not had the routine practice of using ultrasound for femoral cannulations, our procedure may have resulted in complications such as arteriovenous fistula or femoral pseudoaneurysm as a result of perforating the wrong vessel. It could also alert the surgeon toward the possibility of further anatomical variants – interesting, yet potentially dangerous – being present in the same patient. In our case, two further anomalies were found.

Langer's muscle is one of the most common muscular anomalies in the axilla. It is found in 2% to 6% of dissections (6,7). Furthermore, this anomaly has been described in combination with other anatomical variants of flexor compartments of the upper limb (1). As early as



**Figure 3** Closer view of the transjugular spinal accessory nerve (A); internal jugular vein (B); sternocleidomastoid muscle (C)

1977, Sachatello (8) suggested that the Langer's muscle can cause intermittent venous obstruction and, as such, should be considered in the presence of relevant symptoms. This was confirmed more recently by Hafner et al (9), who described a case involving a 17-year-old girl with similar symptoms. These were resolved entirely with excision of the muscle slip. Langer's muscle has been blamed for deep vein thrombosis (10), lymphedema in absence of other causes and compression of the brachial plexus nerves (6,7). In nerve compression cases, the axillary arch may not be the only culprit; as mentioned, this anomaly may be concomitant with presence of Gantzer's muscle for example, which itself can cause median nerve compression. Fortunately, our patient had none of these symptoms. However, we used the LD muscle as a pedicled flap to reconstruct the soft tissue defect of the supraclavicular area after excising the primary tumour. Because the blood supply of the Langer muscle could not be ascertained during this surgical procedure, it had to be excised to reduce the risk of partial flap loss due to potentially insufficient vascularity.

A transjugular course of the SAN is somewhat of a rarer encounter. Setty (11) published a single case of SAN piercing the IJV in 1960 and quoted a case published in German from 1928 by Kessel. In their *in vivo* study, Hinsley and Hartig (4) found that the SAN pierced the IJV in <1% of cases (one in 116). A similar incidence is reported in cadaveric studies by Taylor et al (5) in 2013 (5) (two of 207 cases) and Saman et al (3) in 2011 (one of 67 cases). While this anatomical variation is of a great academic interest, it does not appear to cause any functional issues in itself, unless interventional procedures, such as femoral cannulation, are required.

The presence of such anatomical variants requires extra caution and modification of surgical techniques. Having discovered one anatomical anomaly, it would be unnecessary to search for unrelated variants at distant sites unless it was clinically indicated. Therefore, it is possible that multiple concomitant anatomical variants/anomalies in a single individual are under-reported.

While cadaveric studies report an incidence of up to 6% for the anomaly of the LD muscle, 0.02 % for transposition of femoral vessels in the superior aspect of the femoral triangle and up to 3% for the transjugular course of the SAN, clinical experience suggests it is considerably rarer and can surprise even the most experienced surgeons. The wary surgeon, having identified one anomaly in their patient, should be mindful that there may be others.

**DISCLOSURES:** The authors have no financial disclosures or conflicts of interest to declare.

**ETHICS:** Approval was not required for this study. The individual whose photographs are used in this publication has given written consent to use both their photographs and clinical information.

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